1. Note on some Dermal Plates of *Homosteus* from the Old Red Sandstone of Caithness. By A. Smith Woodward, F.Z.S., of the British Museum (Natural History).

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So much is now known concerning the dorsal shield of the large armoured fish *Homosteus*, from the Old Red Sandstone of N. Scotland and N.W. Russia, that little remains to be added beyond points of detail concerning the form of the various plates. The ventral shield, however, is still unrecognized, and much has yet to be determined in connection with the facial bones. Existing knowledge of the subject is due chiefly to the researches of Hugh Miller[1], Asmuss[2], Pander[3], and Traquair[4]; and further advances can only be made by the discovery of additional specimens.

For one such discovery, which makes known a few novel features of interest, the writer is indebted to Mr. Donald Calder, of Thurso, who has recently forwarded to him an associated group of five dermal plates of *Homosteus milleri* from the Thurso flagstones. The three occipital plates are isolated and beautifully exhibited from the visceral aspect; a smaller, bilaterally symmetrical plate, also exposed from the visceral face, seems to be the anterior median ventral element; and another plate, with an adjacent fragment, is most probably one of the anterior ventro-laterals. The median occipital is shown in the accompanying drawing, fig. 1, p. 199, the left lateral occipital in fig. 2, the anterior median ventral in fig. 3, and an impression of the supposed left anterior ventro-lateral in fig. 4; all the figures being of one quarter of the natural size.

It has long been known that the median occipital plate in *Homosteus* overlaps the lateral occipitals to an enormous extent, but the precise limits of the great facette on each side have not been so clearly exhibited as in the new specimen (fig. 1, *f*). Except in the hinder two thirds of the anterior half, the overlapping surface is more extensive than the exposed visceral face; and in front, where the bone is very robust, it exhibits a pair of broad facettes (*f*), distinct from the lateral pair and thus evidently overlapping the central plates immediately in advance. The exposed median portion exhibits a longitudinal ridge arising shortly in front of the occipital border and soon bifurcating into a symmetrical pair of ridges, which gradually diminish to the anterior third of the bone and then pass into broad undulations bounding a median longitudinal hollow. Posteriorly, where the two lateral occipitals approach most closely, the ridge is an arrowhead-shaped boss, the apex directed backwards and the base forwards; and at this point there may have been a descending plate of bone. At its bifurcation the ridge becomes much less elevated, broader and rounder, gradually diminishing forwards as just described; and on either side is a series of shallow, transverse linear grooves, symmetrically disposed in several

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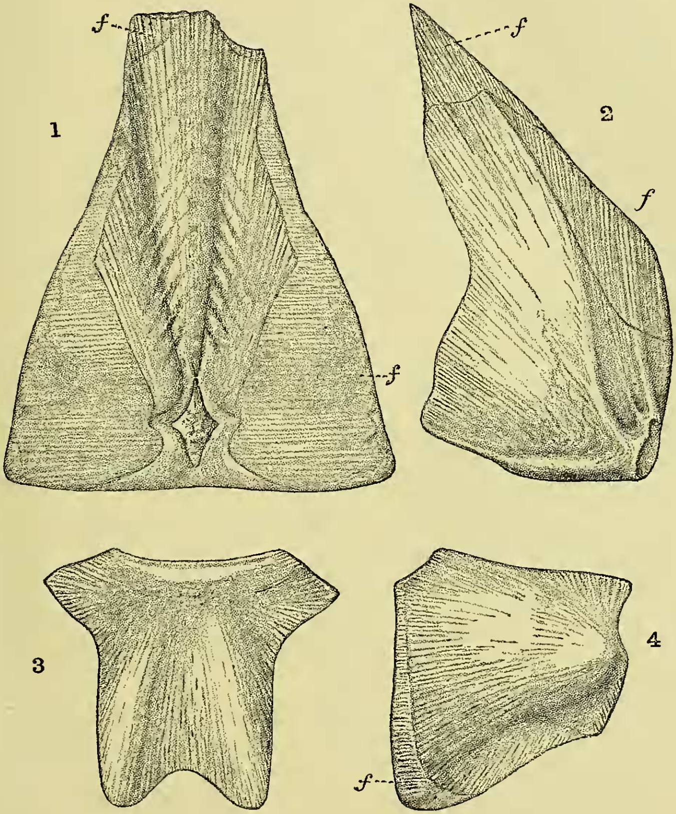
[1] H. Miller, 'Footprints of the Creator (1849), p. 70, figs. 24, 27–29, 36, 37, 39–41.

[2] H. Asmuss, 'Das vollkommenste Hautskelet der bisher bekannten Thierreihe' (Inaug. Dissert. Dorpat, 1856), pp. 8, 35.

[3] C. H. Pander, 'Die Placodermen des devonischen Systems' (1857), p. 74, pl. viii. figs. 2, 3, 6, 7.

[4] R. H. Traquair, "*Homosteus*, Asmuss, compared with *Coccosteus*, Agassiz," Geol. Mag. [3] vol. vi. (1889), p. 1, pl. i.



Figs. 1–4. Dermal plates of *Homosteus milleri*, from the Caithness Flagstones; all shown from the visceral aspect, of one quarter the natural size. 1, median occipital; 2, left lateral occipital; 3, anterior median ventral; 4, impression of left anterior ventro-lateral. *f*, facettes for overlap.

pairs, all directed both backwards and outwards. These markings become very feeble anteriorly, and still await explanation ; behind they are very suggestive of an impression of the anterior part of the spinal cord with its divergent nerves, but in front they appear rather as if corresponding to the septa between the myocommas of the muscular system. The brain itself would certainly have occupied a more anterior situation.

Both the lateral occipitals are well shown from the visceral aspect in the fossil, and that of the left side is represented in fig. 2. The postero-external angle and posterior border are much thickened for articulation with the dorso-lateral plate, but the specimen is somewhat fractured at this margin. A narrow lenticular facette (*f*) extending along the greater part of the outer border, and a large distinct facette (*f*) occupying the anterior apex of the bone, show that it overlapped the marginal and central plates ; but the remainder of the visceral surface would be in direct contact with the soft parts of the animal, and it is quite smooth or exhibits only lines of growth, except at the postero-external angle, where a feeble short ridge is directed forwards and inwards, evidently to strengthen the bony lamina at that point.

Though occurring on a detached fragment of matrix, the bone here interpreted as anterior median ventral (fig. 3) was found so closely associated with the occipitals already described, that Mr. Calder, who is an experienced collector, has no doubt as to its pertaining to the same individual. Its borders are completely preserved, thus proving that its obvious bilateral symmetry is not accidental ; and the absence of facettes on the smooth visceral aspect, except possibly behind, indicates that it must have been overlapped by any lateral plates that were originally adjoining. The anterior border is nearly straight, and accompanied by a low, rounded, transverse ridge ; and the anterior is the broader end of the bone, being produced on either side into a short and broad triangular extension. The thin hinder border is excavated by a symmetrical re-entering angle, into which the front margin of a diamond-shaped median ventral plate doubtless fitted.

The fourth plate under consideration (fig. 4) also occurs upon a detached fragment of matrix, and is shown only as an impression of its visceral surface. The borders, however, are almost completely preserved ; and the impression proves that the bone was not quite flat, but marked by two broad rounded folds extending and diverging from the shortest of the four margins. This margin is gently excavated, with a sharp angle at one end and a rounded corner at the other ; while the only distinct evidence of an overlapping facette is at the opposite border, which seems to have been much attenuated. The state of preservation does not permit of ascertaining whether any other facettes were present ; but the outline of the bone agrees so closely with that of the anterior ventro-lateral plates of *Coccosteus* that it is probable the two long borders joining those already noticed were also overlapping. Indeed, the element now described seems to differ only from the anterior ventro-lateral plates of *Coccosteus* in its